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THE GASTROPODS, *CALLIOSTOMA ORION* DALL, 1889 (TROCHIDAE)
AND *HELIACUS (GYRISCUS) WORSFOLDI* N. SP.
(ARCHITECTONICIDAE), FROM THE BAHAMA ISLANDS

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ABSTRACT

Heliacus (Gyriscus) worsfoldi n. sp., is described from the northwestern Bahamas. *Calliostoma orion* Dall, 1889, is redescribed and the radula and jaws are illustrated by SEM micrographs. *Calliostoma orion* lives in and feeds upon the tube sponge, *Spinoseella vaginalis*. *Heliacus worsfoldi*, the first record of the subgenus *Gyriscus* in the western Atlantic, is associated with a species of *Zoanthus* or *Parazoanthus*.

The use of SCUBA equipment by shell collectors has opened an immense area of heretofore inaccessible ocean bottom for examination. This is especially true of the deep fore-reef zone of coral reef tracts such as occur in the Bahama Islands. Numerous specimens of gastropods collected near Freeport, Grand Bahama Island, were loaned to me for identification by Mr. Jack

Worsfold. Among these specimens are some representing two species with unusual biological associations.

Type-specimens are deposited in the collections of the U. S. National Museum of Natural History, Washington, D.C., the Academy of Natural Sciences, Philadelphia, Pennsylvania, and the Florida Department of Natural Re-

sources, Marine Research Laboratory, St. Petersburg, Florida, abbreviated USNM, ANSP, and FSBC I respectively. Additional specimens are in the personal collections of Messrs. Jack Worsfold and Bob Quigley, Freeport, Grand Bahama Island.

Family Trochidae Rafinesque, 1815

Genus *Calliostoma* Swainson, 1840

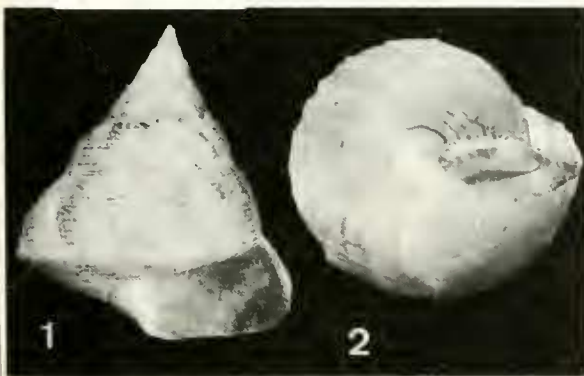
***Calliostoma orion* Dall, 1889**

Figures 1-13

Calliostoma orion Dall, 1889a: 367, pl. 28, fig. 2; 1889b: 162. - Pilsbry, 1889: 383, pl. 48, fig. 18. - Johnson, 1934: 70. - Clench and Turner, 1960: 54, pl. 35, figs. 1, 2.

Description—Shell medium in size, height to about 16 mm, turbinate, imperforate, delicately sculptured by numerous spiral rows of small beads, teleoconch whorls 8-8½; color straw or bone white, often with nebulous areas of light-brown, always with fine, spiral brown lines. Protoconch small, white, 1½ whorls. Early teleoconch whorls flat-sided, last 3 distinctly convex. Spiral sculpture of 20-26 fine cords ornamented by small, sharp, spirally elongate tubercles; cords generally alternate in size. Base almost flat, sculptured by 28-40 smooth spiral cords, generally every fourth larger and colored brown; cords made somewhat undulate by irregular growth lines. Aperture subquadrate; outer lip thin, simple; columella short, thick, straight, white. Operculum thin, multispiral, light amber in color.

Radula typically calliostomatine (Figures 3, 4).



FIGS. 1 and 2. *Calliostoma orion* Dall, 1889. 1, Apertural view, USNM 784595, 14.8 mm high. 2, Basal view of same specimen.

Rachidian slender, base pyriform, with long, slender, finely denticulate cusp. Laterals 5; bases pyriform, becoming rhombic on distal 2 (Figure 5); cusps long, slender, becoming very slender on outer laterals, finely denticulate on both sides. Marginals numerous, about 25-30 per half-row; inner marginal large, massive, usually with 6-8 large, strong teeth on proximal margin of tip, finely denticulate on distal margin, with prominent buttress opposite toothed margin (Figure 6); succeeding inner marginals of similar, although less massive, structure without buttress (Figures 4, 6, 7); outer marginals very slender, whisker-like, with fine teeth along both sides of tip, occasionally smooth.

Jaws chitinous, subrectangular, rounded anteriorly and posteriorly, fringed anteriorly (Figures 10, 11). Two major plates joined dorsally by pair of smaller, elongate, corrugated plates (Figures 9, 10). Outer surface of jaws comprised of small, elongate, hexagonal or diamond-shaped scales (Figure 12); inner surface vaguely reflecting outer texture (Figure 13).

Holotype—USNM 214272. Height 4.5 mm; maximum diameter 4.2 mm.

Type-locality—BLAKE station, off Havana, Cuba, 146 m.

Material examined—BLAKE station, off Havana, Cuba, 146 m; 1 spec., USNM 214272 (Holotype).—Off Tamarind, Lucaya, Grand Bahama Island, Bahamas, on sponge, 15-43 m, J. Worsfold collector; 1 spec., USNM 784595; 1 spec., USNM 784597; 2 spec., ANSP 353315; 1 spec., FSBC I 22163; 1 spec., FSBC I 23777.—Little San Salvador, Bahamas, on sponge, 34 m, J. Tyler collector; 1 spec., USNM 706809.—Providencia Island, Colombia, N. A. Roberts, leg.; 1 spec., ANSP 316567.

Distribution—Known from the eastern and northwestern Bahamas, northern Cuba, and the western Caribbean off Nicaragua, at depths of 15-43 m and 146 m.

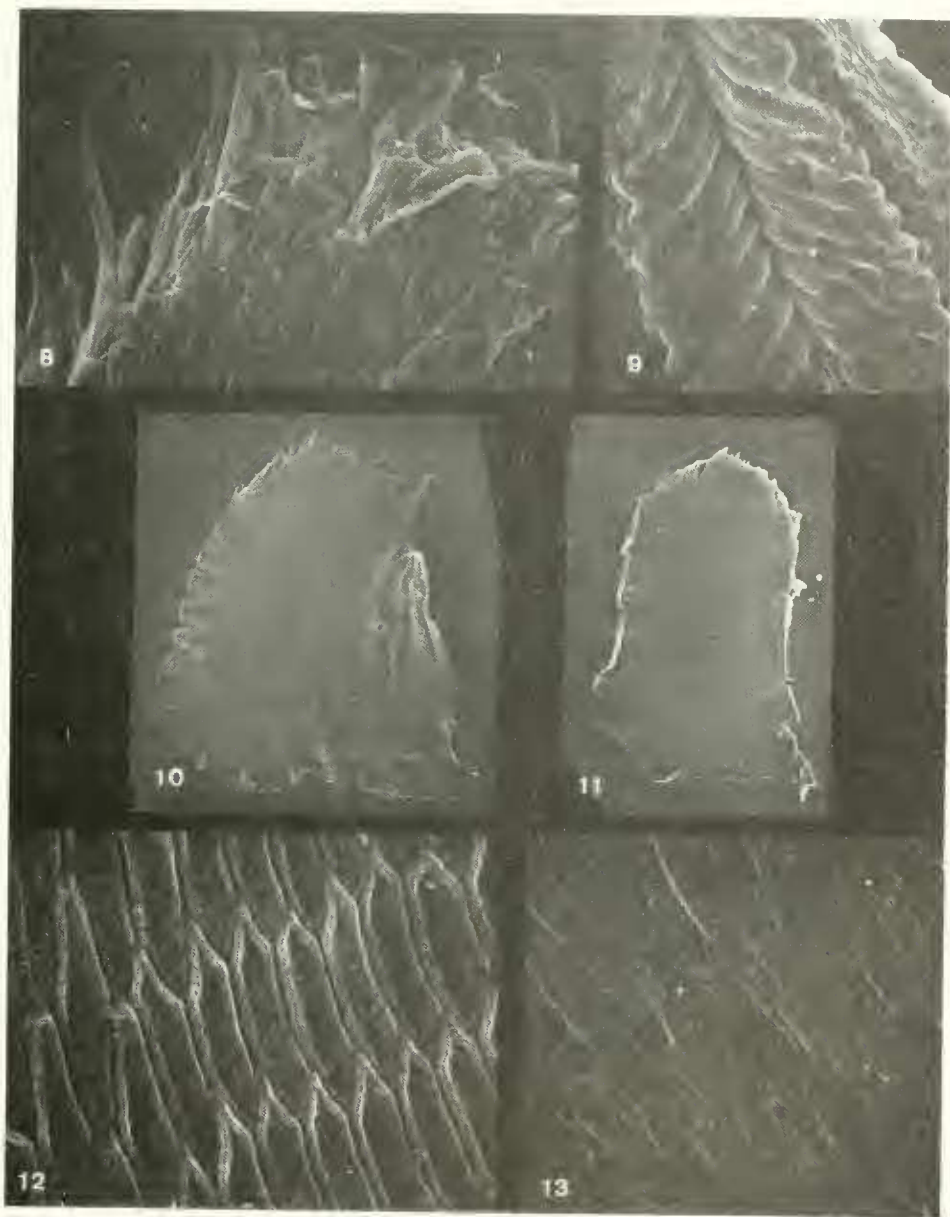
Remarks—Until now *Calliostoma orion* has been known from only two shells: the holotype, a juvenile, collected from 146 m off Havana; and a second specimen found at Arenas de la Chorrera in sand dredged from 5-27 m off Sante Fe, Cuba (Clench and Turner, 1960). Both speci-



FIGS. 3-7. SEM micrographs of radula of *Calliostoma orion* Dall, 1889 (FSBC I 22163). 3, Composite micrograph of radula; 75 \times . 4, Segment showing laterals and marginals; note denticulation of proximal and distal edges of marginals; 300 \times . 5, Detail of outer two laterals; apparent fusion of several teeth is an artifact of mounting; 412 \times . 6, Detail of tip of first inner marginal showing heavy buttress; 658 \times . 7, Marginal from middle of marginal half-row; 600 \times .

mens are bone white in color with the characteristic spiral brown lines very faint. The specimens from Providencia and Little San Salvador

Island are also albinistic. However, all specimens examined from Grand Bahama Island are rather richly colored, with brown clouds



FIGS. 8-13. SEM micrographs of jaws of *Calliostoma orion* Dall, 1889 (FSBC I 22163). 8, Anterior fringe of left lateral plate; 375 \times . 9, Surface detail of dorsal connecting plates; 375 \times . 10, Left lateral plate and two dorsal plates, external surface; 60 \times . 11, Right lateral plate, internal surface; 60 \times . 12, Lateral plate external surface microsculpture of elongate hexagonal and tetragonal scales; 150 \times . 13, Lateral plate internal surface microsculpture; 150 \times .

superimposed on a straw-colored background, and numerous, distinct brown spiral lines.

In outline, *Calliostoma orion* is extremely similar to *C. marionae* Dall, 1906. The upper

whorls are flat-sided, forming an evenly conical spire, but the last 2 or 3 whorls are convex, with the base remaining almost flat throughout. The whorl periphery becomes less angular as growth

progresses. *Calliostoma orion* also differs from *C. marionae* in having beaded sculpture and no umbilicus, as well as being considerably smaller. The very small, sharply-pointed beads on the upper part of the whorls and the shape of the shell immediately separate *C. orion* from other imperforate species, such as *C. euglyptum* (A. Adams, 1854) and *C. sarcodum* Dall, 1927, with which it may be confused.

The radula and jaws are very similar to those described and illustrated for the subgenus *Calliostoma* as restricted by Clench and Turner (1960). In this subgenus there are five marginals with long, slender cusps, a massive inner marginal followed by a number of teeth of less massive but similar structure, and an outer series of very slender marginals. The radula of *C. orion* differs primarily in the shape of the first marginal tooth, especially the buttressed tip and slender rhachis which are more similar to those in the subgenera *Kombologion* Clench and Turner, 1960, and *Elmerlinia* Clench and Turner, 1960. Until radulae of more species of *Calliostoma* are examined using SEM, I refrain from assigning *C. orion* to a subgenus.

This species, as far as is known, occurs only on deep reefs of the northern and western Caribbean islands. It is not uncommon in depths from 15 to 43 m (50–140 ft) and is always found in the tube sponge, *Spinosella vaginalis* (Lamarck, 1814), in the Bahamas (J. Worsfold, personal communication). A number of recent papers have documented the feeding of *Calliostoma* species on coelenterates (Lang, 1970; Salvini-Plawen, 1972; Francis, 1973; Miller, 1973; Perron, 1975; Perron and Turner, 1978), bryozoans (Perron, 1975), and dead animal flesh (Keen, 1975; Perron, 1975), in addition to the herbivorous or detrital diets previously thought characteristic of all trochids. An examination of the contents of the intestine of a specimen of *C. orion* revealed numerous spicules of *Spinosella vaginalis* (straight oxeas), cellular material of indeterminate origin, and small calcareous fragments. In view of the previous observations of opportunistic feeding of *Calliostoma* spp. and the presence of sponge spicules in the fecal material of *C. orion*, it is probable that this

species does in fact feed on *Spinosella*, the first such observation for *Calliostoma*.

Family Architectonicidae Gray, 1850

Genus *Heliacus* Orbigny, 1842

Subgenus *Gyriscus* Tiberi, 1867

Heliacus (Gyriscus) worsfoldi n. sp.

Figures 14, 15

Description—Shell small, height to 7.3 mm, solid, turbinate, umbilicate, with high spire; whorls rounded, sculptured by spiral rows of beads; color of shell whitish to light mauve, with 8–10 axially elongate blotches of light-brown around periphery; umbilicus purplish brown within, columella stained with purplish brown. Protoconch anastrophic, prominent, glassy, brown, 0.84 mm in greatest diameter. Teleoconch whorls 4, subtubular, with 5 or 6 beaded, spiral cords above periphery and 8 or 9 (rarely 7 or 10) on base; axial sculpture of low, rounded, flexuous threads. Umbilicus narrow, about 15% of greatest shell diameter, lightly wrinkled by growth lines. Aperture circular; outer lip thin, crenulated by external sculpture; columella concave, lip slightly reflected, smooth. Operculum thin, circular, multispiral, light-brown in color; external surface concave, with concentric overlapping foliations; nucleus central; inner side with prominent, clockwise-spiraled central plug.

A color slide (*ex* J. Worsfold) of the ventral view of a specimen with animal expanded shows the foot deeply bifid anteriorly and broadly



FIGS. 14 and 15. *Heliacus (Gyriscus) worsfoldi* Quinn, n. sp. 14, Apertural view of holotype, USNM 784593, 7.3 mm high. 15, Basal view of same specimen.

rounded posteriorly. Color of foot light mauve, with numerous spots of opaque white. Tentacles long, tapering gradually to rather bluntly rounded tips; color light mauve, with zig-zag markings of darker purple. Radula not preserved.

Holotype—USNM 784593. Height 7.3 mm; maximum diameter 6.2 mm.

Type-locality—Off Settlement Point, Grand Bahama Island, 12.2 m, J. Worsfold and B. Quigley, collectors.

Paratypes—USNM 784596, 2 spec.; FSBC I 23778, 2 spec.; ANSP 353241; 2 spec.; J. Worsfold and B. Quigley collections, 43 spec.; all specimens with same data as holotype.

Remarks—*Heliacus worsfoldi* is the third known species of the subgenus *Gyriscus*, which was established by Tiberi (1867) for *Gyriscus jeffreysianus* Tiberi, 1867, described from off Sardinia, Italy. One of the three syntypes of *H. jeffreysianus* is in the USNM and has been re-described by Merrill (1970). Specimens of the new species are superficially very similar to those of *H. jeffreysianus* but are smaller, have a smaller protoconch [range 0.810–0.875 mm, \bar{x} = 0.84 mm for *H. worsfoldi*; 0.95 mm for *H. jeffreysianus* (Merrill, 1970)], have fewer primary spiral cords (5 or 6, not 7), lack intercalary secondary spiral threads, have a proportionally narrower umbilicus (*H. worsfoldi*: 15% of maximum shell diameter; *H. jeffreysianus*: 20%), and are a different color. Powell (1965) described *Gyriscus asteleformis* from off the northern tip of North Island, New Zealand, from a depth of 50 fathoms. Powell's species differs from *H. worsfoldi* in being larger, proportionally broader, uniformly buff-colored, in having more numerous and more finely beaded spiral cords, and a larger umbilicus.

All of the specimens of *H. worsfoldi* were collected together on a specimen of the antipatharian, *Cirripathes* sp., which was largely entrusted by a species of *Zoanthus* or *Parazoanthus*. Previously, architectonicids have been observed in association with scleractinian corals (Robertson, Scheltema and Adams, 1970) and the zoanthinarians *Zoanthus* and *Palythoa* (Robertson, 1967; Marche-Marchad, 1969), and Powell (1965) reported *Heliacus* (*Gyriscus*) *steleformis* from the cavity of a sponge.

Robertson (1981) has recently reviewed the gastropods symbiotic with zoanthinarians, of which assemblage *Heliacus* was a major constituent. It is therefore probable that *H. worsfoldi* is also symbiotic with the zoanthid, although the possibility of an association with antipatharians cannot yet be dismissed.

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